

(12) UK Patent Application (19) GB (11) 2 003 840 A

(21) Application No: 7835739

(22) Date of filing:  
6 SEP 1978

(23) Claims filed:  
6 SEP 1978

(30) Priority data:

(31) 2740923

(32) 10 SEP 1977

(33) FED. REP. OF  
GERMANY (DE)

(43) Application published:  
21 MAR 1979

(51) INT. CL.<sup>2</sup>: B67C 1/06

(52) Domestic classification:  
B8T 26D1

(56) Documents cited:

GB 1055460

GB 1019278

GB 990333

GB 943585

GB 224658

(58) Field of search:

A4F

B8T

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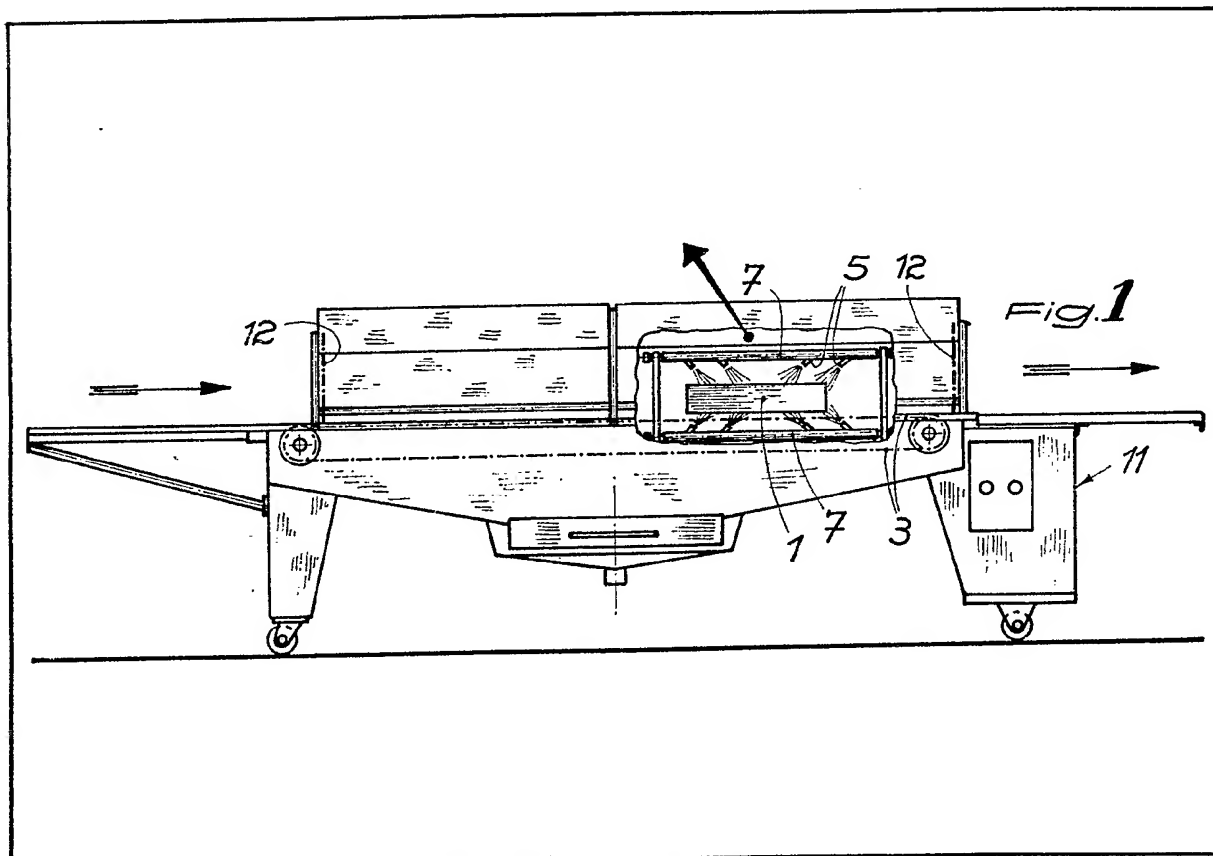
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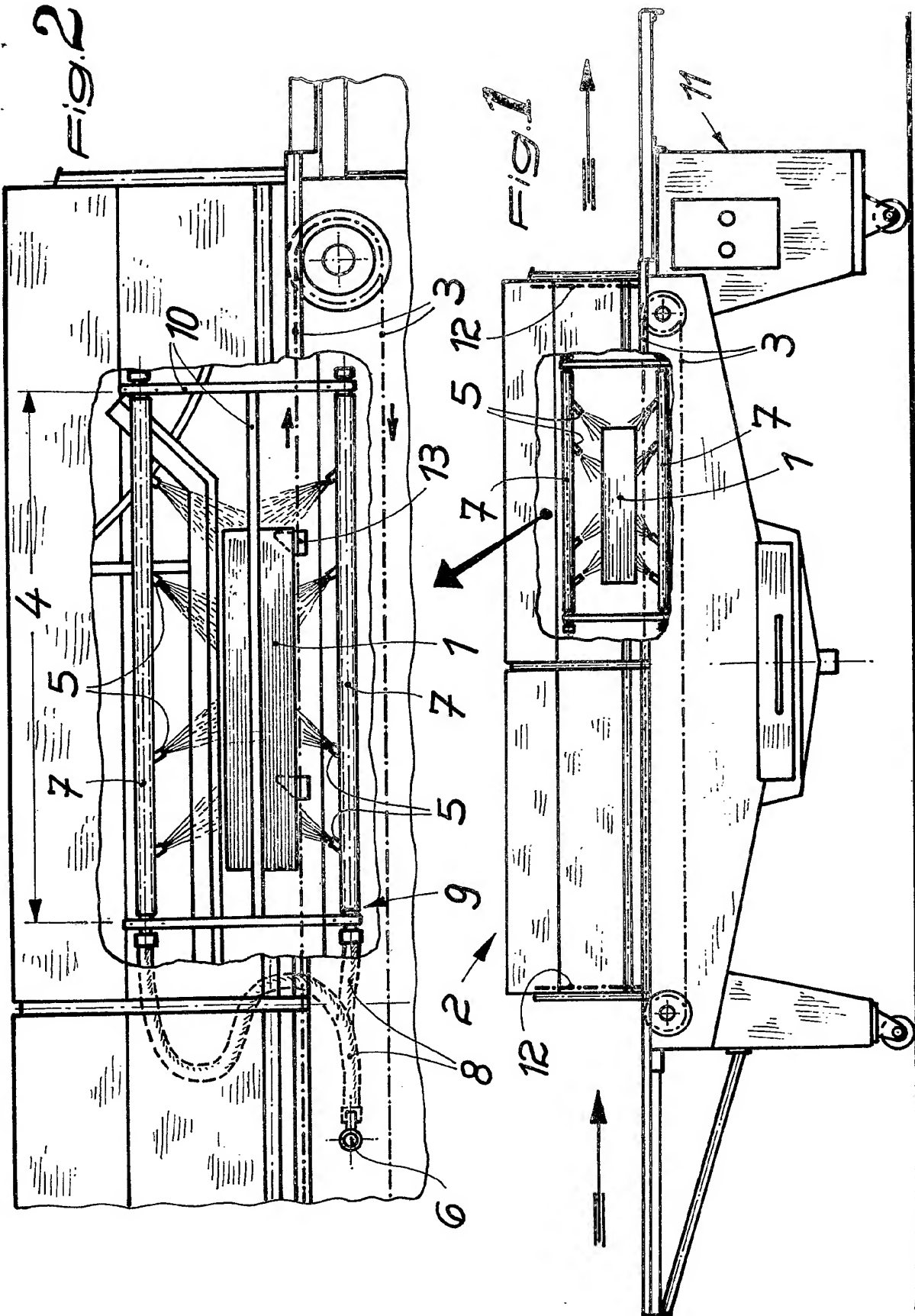
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(54) A DEVICE FOR CLEANING  
TWO- AND THREE-  
DIMENSIONAL OBJECTS SUCH  
AS PLASTICS CONTAINERS

(57) A device for cleaning objects 1  
such as plastics containers with  
reduced consumption of cleaning  
medium and energy compared with  
prior proposals comprises a washing  
tunnel 2, a handling device 3 for the  
objects passing through the tunnel  
and washing nozzles 5, the latter  
oscillating within a prescribed  
frequency range, e.g. 5-10 Hz, such  
that cleaning medium is sprayed over  
the entire surface of the objects to be  
cleaned.



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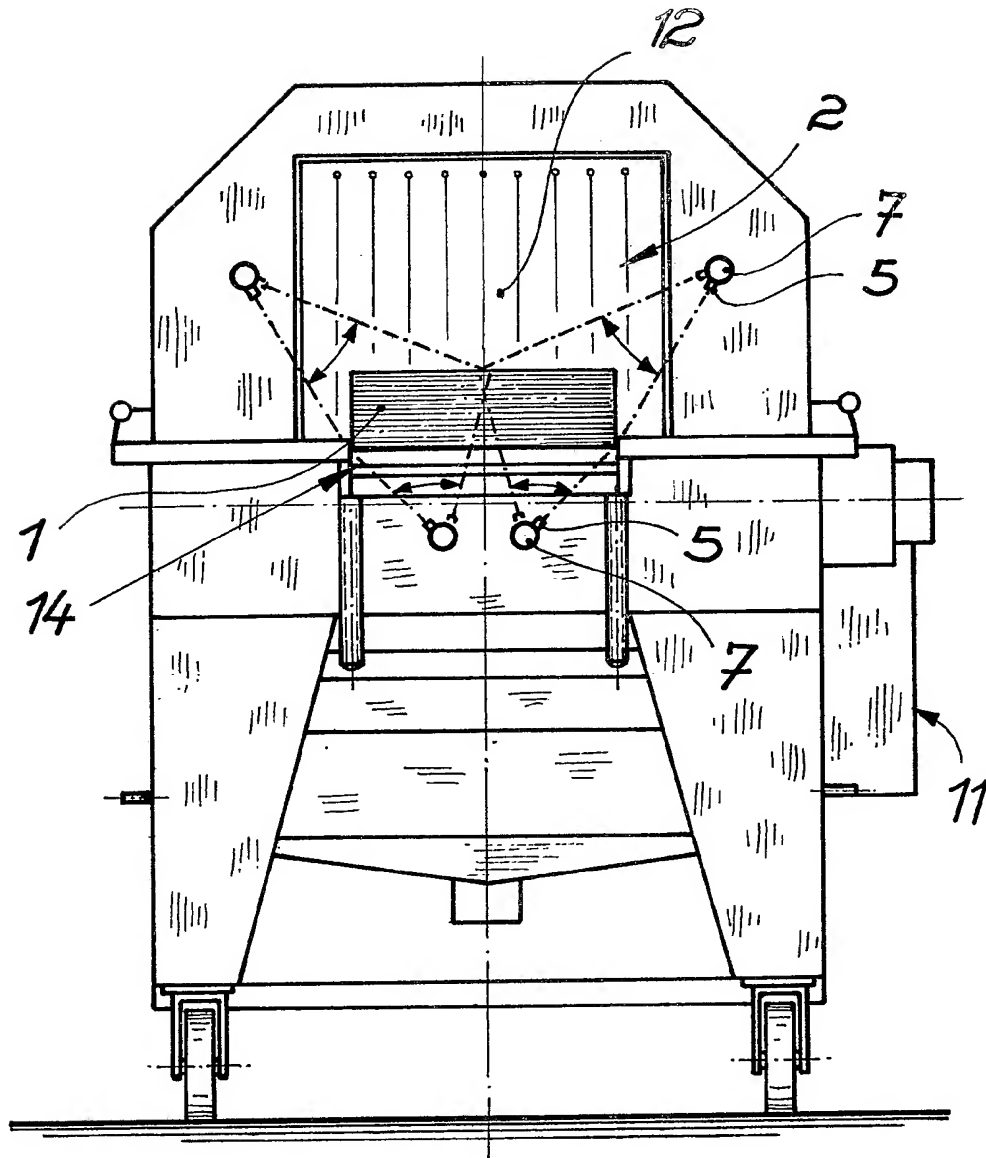


Fig. 3

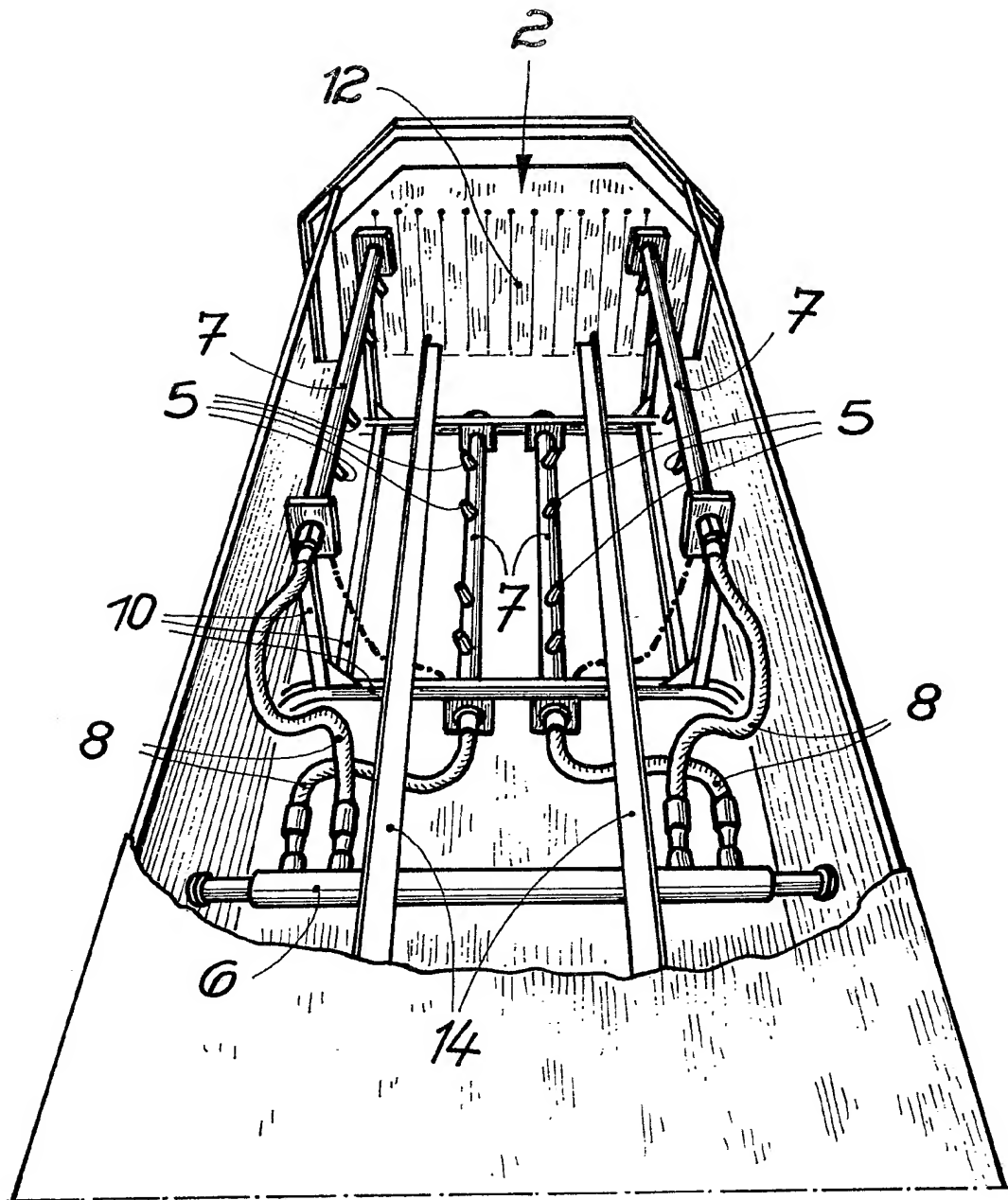


Fig. 4

## SPECIFICATION

## A DEVICE FOR CLEANING TWO- AND THREE-DIMENSIONAL OBJECTS SUCH AS PLASTICS CONTAINERS

5 The invention relates to a device for cleaning two- and three-dimensional objects such as plastics containers, a known device consisting of a washing tunnel, a handling device for the objects passing through the washing tunnel and nozzles, disposed in the washing tunnel and directed at the washing path, to spray the objects with a liquid cleaning medium.

The objects referred to in connection with the invention embrace the widest variety of  
15 containers, boxes, trays, shelves, sheets and the like. Foodstuffs such as fruit, vegetables, meat, fish, drinks and the like are increasingly handled in plastics containers. The use of plastics facilitates the production of durable packaging materials, which can circulate for years between producers and consumers. On the other hand, there are cleaning problems associated with both the higher standards of hygiene and the properties of plastics materials, which render them liable to  
25 collect very firmly adherent dirt which becomes very visible. For this reason, the known cleaning devices usually involve the use of a cleaning medium which can only function with the application of chemicals and heat. The preparation of such cleaning media is costly. Moreover, however, their cleaning efficiency is unsatisfactory, since it is necessary to use substantial volumes of liquid, and there is a considerable energy consumption, at least if heat  
35 must be applied.

The object of the invention is to provide a device for cleaning two- and three-dimensional objects such as plastics containers, whereby a particularly simple and high-performance construction is achieved and more particularly a satisfactory cleaning action is obtained at reduced consumption rates with respect to cleaning medium and energy, while no chemicals or heat are required.

45 According to the present invention, there is provided a device for cleaning two- and three-dimensional objects such as plastics containers, the device comprising a washing tunnel, a handling device of the objects passing through the tunnel and nozzles, disposed in the tunnel and directed at a washing path to spray the objects with a liquid cleaning medium, the nozzles being connected to a high-pressure mains and constructed so as to oscillate within a prescribed frequency range such that high-pressure cleaning medium is sprayed over the entire surface of the objects, which move past the nozzles at a prescribed distance therefrom.

60 Thus, the invention makes use of oscillating rather than stationary spray nozzles, with the purpose of raising the effectiveness of the cleaning medium and thereby lowering the necessary output of the installation, while the

cleaning medium is supplied to these nozzles under high pressure. The nozzles cover the entire surface of the objects requiring cleaning, as they move relative to them, provided the frequency, speed of advance, number of nozzles and spray coverage angle are correctly adjusted. The coverage of each individual nozzle, already considerably extended by the mechanical conditions, is further enhanced by the hydraulic effect, whereby liquid jets with a varying angle of incidence give rise to a complex droplet impact pattern which substantially enhances the cleaning action in the sense of dirt removal. This is particularly so when, in accordance with a preferred embodiment of the invention, the nozzles are supplied with high-pressure water at  
80 100 bar or more as the cleaning medium. Thus in contrast to the known cleaning devices the cleaning device of the invention can operate with high-pressure water, thereby greatly reducing the volume of water required and rendering chemicals and heat completely unnecessary.

Further preferred features of the invention will now be described. Thus, the nozzles may oscillate in the frequency range 5 to 10 Hz. This has proved to be the most effective range and it occasions no technical problems. The nozzles preferably have a coverage angle of up to 10° and described a 60° angle of oscillation about their axis, or more strictly speaking an amplitude of 60° to either side. Preferably, some of the nozzles on either  
95 side of the passing objects requiring cleaning operate in the direction of advance while others operate against the direction of advance. Moreover, some nozzles can be mounted above the open washing path and others below the open washing path. With this arrangement, the nozzles spray the entire surface of objects passing along the washing path, inverted plastics containers for example, from the middle of the container floor to the lower rim of the container wall.

100 Correspondingly, the nozzles disposed below the washing path ensure that the open underside of the plastics containers is cleaned once again from the midline to the lower rim of the container wall. The nozzles directed forwards and backwards ensure that as the plastics containers pass through the cleaning device they are sprayed and cleaned by the high-pressure water jets, inside, outside and also on the sides aligned across the longitudinal axis of the device. The nozzles are preferably mounted at adjustable angles on nozzle beams running longitudinally on both sides of the washing path, both above it and below, while the nozzle beams are actuated by a hydraulic, pneumatic or electric oscillation driving unit. In other words, in this arrangement the nozzle beams and the nozzles on them are oscillated. The nozzle beams are preferably swivelably mounted at their outer ends and oscillate about their longitudinal axes. It is preferable to connect the nozzle beams to the high-pressure mains through intermediate high-pressure hoses, which hoses are connected axially to the beam ends so that swivelable connections can be provided. According to a

further preferred feature of the invention, the swivellably mounted nozzle beams are connected together by a framework, so that a single oscillation driving unit suffices to oscillate or swing all the nozzles. The cleaning device of the invention can be constructed as a relatively compact mobile washing unit having a high-pressure pump, a receiving tank for the cleaning medium, sieve boxes and a recycling or drainage circuit. Doorways into and out of the washing tunnel preferably have a laminated curtain adapted to allow objects to enter for cleaning and then depart without allowing the cleaning medium to escape in substantial amounts. The handling means can be constructed as an endless chain having carriers sets at prescribed intervals, together with a guide for the objects to be cleaned.

The advantages accruing from the invention are to be seen substantially in that it provides a cleaning device for two and three-dimensional objects or the like, with particular reference to plastics containers, whereby the construction becomes relatively simple yet functionally reliable, and more particularly objects are satisfactorily cleaned to a high degree of cleanliness at a relatively low energy cost, without resorting to chemicals or heat. The high energy content of the high-pressure water used as the cleaning medium, and the correspondingly high degree of cleaning, facilitate the construction of a tunnel-type continuous cleaning device, through which objects requiring cleaning can be passed in large numbers, while maintaining clearly defined positions, prescribed spacings and a positive feeding action. The amount of equipment needed for the purpose is comparatively small and it is possible to construct either stationary or mobile units.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings in which:—

Figure 1 is a schematic side elevation of a cleaning device of the invention, with the wall of the washing tunnel partly removed;

Figure 2 shows part of the device of Figure 1 on a larger scale;

Figure 3 is a front elevation of the device of Figure 1; and

Figure 4 is a perspective view from above the part of the object of Figure 1.

The device shown in the drawings, for cleaning two- and three-dimensional objects 1 such as plastics containers, consists basically of a washing tunnel 2, a handling device 3 for the objects 1 passing through the washing tunnel 2 and nozzles 5, disposed in the washing tunnel 2 and directed at the washing path 4, to spray the objects 1 with a liquid cleaning medium. The spray nozzles 5 are connected to a high-pressure mains 6 and are constructed so as to oscillate within a prescribed frequency range such that the high-pressure cleaning medium is sprayed over the entire surface of the objects 1 requiring cleaning, which move past them at a prescribed distance

therefrom. The nozzles 5 are supplied with high-pressure water at 100 bars or more as the cleaning medium. They oscillate in the frequency range 5 to 10 Hz. Furthermore, the nozzles 5 have a coverage angle of up to 10° and described a 60° angle of oscillation about their axis. Some of the nozzles 5 on either side of the passing objects 1 requiring cleaning operate in the direction of advance, while other nozzles 5 operate against the direction of advance. Similarly, some of the nozzles 5 are mounted above the open washing path and other nozzles 5 are mounted below it. The nozzles 5 are mounted at adjustable angles on nozzle beams 7 running longitudinally on both sides of the washing path 4, both above it and below. The nozzle beams 7 are actuated by a hydraulic, pneumatic or electric oscillation driving unit, so that the nozzle beams 7 and the nozzles 5 are oscillated. The nozzle beams 7 are swivellably mounted at their ends and oscillate about their longitudinal axes. They are connected to the high-pressure mains 6 through intermediate high-pressure hoses 8. Moreover, the high-pressure hoses 8 are connected axially to the beam ends 9, so that swivelling connections are unnecessary. The nozzle beams 7 are further connected together by a framework 10, so that a single oscillation driving unit suffices. The nozzles 5 are disposed on the nozzle beams 7 to face inwards, either opposite each other or staggered. The entire cleaning device constitutes a mobile washing unit 11, having a high-pressure pump, a receiving tank for the cleaning medium, sieve boxes and a recycling or drainage circuit. Doorways into and out of the washing tunnel 2 have a laminated curtain 12. The handling device 3 consists of an endless chain having carriers 13 set at prescribed intervals, and a guide 14 is provided for the cleaning of e.g. plastics containers. The handling means can be adapted to the type of object 1 requiring cleaning.

## CLAIMS

1. A device for cleaning two and three-dimensional objects such as plastics containers, the device comprising a washing tunnel, a handling device for the objects passing through the tunnel and nozzles, disposed in the tunnel and directed at a washing path to spray the objects with a liquid cleaning medium, the nozzles being connected to a high-pressure mains and constructed so as to oscillate within a prescribed frequency range such that the high-pressure cleaning medium is sprayed over the entire surface of the objects, which move past the nozzles at a prescribed distance therefrom.

2. A device as claimed in Claim 1, wherein the nozzles are supplied with high-pressure water at 100 bar or more.

3. A device as claimed in Claim 1 or Claim 2, wherein the nozzles oscillate in the frequency range 5 to 10 Hz.

4. A device as in any preceding Claim, wherein the nozzles have a coverage angle of up to 10° and oscillate about their axis.

5. A device as claimed in any preceding Claim, wherein the nozzles oscillate through 60°.

6. A device as in any preceding Claim, wherein some of the nozzles on either side of the objects operate in the direction of object advance, while other spray nozzles operate against the direction of object advance.

7. A device as claimed in any preceding Claim, wherein some of the nozzles are mounted above the washing path and others below the wash path.

8. A device as claimed in any preceding Claim, wherein the nozzles are mounted at adjustable angles on nozzle beams running longitudinally on both sides of the washing path, both above it and below, while the nozzle beams are actuated by a hydraulic, pneumatic or electric oscillation driving unit.

9. A device as claimed in Claim 8, wherein the nozzle beams are connected to high-pressure mains through intermediate high-pressure hoses, which hoses are connected axially to ends of the beams.

10. A device as in any one of Claims 8 or 9,

wherein the nozzle beams are connected together by a framework.

11. A device as in any one of Claims 8 to 10, wherein the nozzles are disposed on the nozzle beams to face inwards, either opposite each other or staggered.

12. A device as in any preceding Claim, wherein a mobile washing unit is provided, having a separate or integrated high-pressure pump, a receiving tank for the cleaning medium, sieve boxes and a recycling or drainage circuit.

13. A device as claimed in any preceding Claim, wherein doorways into and out of a washing tunnel have one or more laminated curtains.

14. A device as claimed in any preceding Claim, wherein the handling device consists of an endless chain with or without carriers, together with a guide for the objects to be cleaned.

15. A device for cleaning two- and three-dimensional objects such as plastics containers substantially as hereinbefore described with reference to the accompanying drawings.